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MASS GIS NEWSLETTER

Massachusetts Geographic Information System Summer 1987 Volume I

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MASSACHUSETTS GIS PROJECT OVERVIEW

In October of 1986 the Massachusetts Hazardous Waste Facility Site Safety Council (HWFSSC), and the United States Geological Survey entered into a 3 year cooperative agreement to start production of a geographic information system (GIS) for Massachusetts. Funds are provided by the HWFSSC and most computer resources and training are supplied by the USGS.

The objectives of the HWFSSC are to build a foundation GIS database and to use this database in a land-suitability assessment for the siting of facilities for hazardous waste treatment, storage and disposal. The objectives of the USGS are to incorporate water resources data into the GIS database and to use GIS technology to display and analyze water resources related data.

The GIS database is designed to become the foundation for a more comprehensive, environmental GIS to be implemented by the Massachusetts Executive Office of Environmental Affairs.

Because of the long term utility of the data, the Massachusetts GIS Project has placed an emphasis on documenting design and quality standards.

THE PRODUCTION ENVIRONMENT

The MASS-GIS Project uses the ARC/INFO software developed by Environmental Systems Research Institute (ESRI) of Redlands, CA. It is installed on the Prime 9955 minicomputer housed in the Boston office of USGS.

Two workstations, both equipped with Altek digitizing tables, are in operation. Station 1, at USGS, uses a Tektronix graphics terminal. Station 2, at HWFSSC, is connected to the Prime via a 9600 baud modem. The graphics terminal is an IBM-PC/AT with an EGA graphics card and Tgraf-07 terminal emulation software.

Graphic output is produced on a small HP7475 pen plotter, a Tektronix 4696 ink jet screen copier, and a Zeta 36-inch four pen drum plotter.

PRELIMINARY EOEA GIS DATA STANDARDS DRAFTED

The GIS Sub-Committee of the EOEA Data Policy Work Group has given preliminary approval to a set of working GIS data standards. These standards attempt to lay a coordinated framework for building a large, compatible GIS database from the separate efforts of several EOEA agencies pursuing GIS projects.

These standards principally involve two areas:

1) the selection of high quality, well documented source material for automation, and

2) quality control during automation to insure that any degradation of the source material is understood, minimized, and documented.

The draft standards contain very few technical specifications (such as required software, or specific data formats). Rather, they are designed to inform users about technical issues and options, to facilitate the selection of source materials, and to foster the creation of a compatible statewide database.

Currently the HWFSSC/USGS MASS-GIS project and the CCAMP/DEQE/USGS/EPA project will be adhering to these standards as they build project databases. EOEA will check proposed GIS related projects for planned conformance to the standards during the project approval/AF29 process.

Copies of the draft data standards are available upon request.

Cooperative project of the Massachusetts Hazardous Waste Facility Site Safety Council and the U.S. Geological Survey, Water Resources Division.

GIS DATA LAYERS

Several data layers are scheduled for input into the Massachusetts GIS database during the three year HWFSSC-USGS cooperative project.

Data layers to be digitized by project staff:
POLITICAL BOUNDARIES This data layer is complete. See the accompanying article **"Massachusetts Base Map Completed"**.
DRAINAGE BASINS This layer is 10% complete. It is composed of the approximately 1,720 basins and subbasins as delineated on the USGS-WRD 1:24,000 quadrangle manuscripts.
SURFICIAL GEOLOGY This layer is 25% complete. It is based on 1:125,000 manuscripts prepared by the USGS Geologic Division in Reston, VA. Sand and gravel deposits are differentiated from areas of till and/or bedrock.

The remaining data layers are being reformatted from existing digital data sets:
HYDROGRAPHY This layer, including shoreline, rivers, streams and water bodies, is being produced by USGS National Mapping Division (NMD). They are using scanning technology and producing Digital Line Graph (DLG) tapes from 1:25,000 stable based quads. Approximately 10% of the state has been delivered by NMD.
TRANSPORTATION This layer includes all roads, railroads and pipelines found on the 1:25,000 quad sheets. It is being produced by NMD in a manner similar to the Hydrography layer. The project team is converting these data sets from the NMD format into the MASS-GIS system.
GEOGRAPHIC NAMES This data layer was created from a USGS-NMD tape of over 10,000 names compiled from 1:25,000 quads.
PUBLIC WATER SUPPLIES, WASTE SOURCES, and EPA FACILITIES These data layers are being reformatted from digital data sets that are maintained by the USGS, Mass DEQE and the EPA.
LAND USE A small scale 1:250,000 statewide data layer has been assembled from a USGS NMD digital tape. The source material was 1972-1974 high altitude photography interpreted into about 25 land-use types. Resolution for urban categories is about 10 acres. More detailed digital land use data may become available for much of Massachusetts from the Resource Mapping Group of the Dept of Forestry and Wildlife Management at U. Mass, Amherst.

1987 ARC/INFO USERS CONFERENCE.

Five hundred ARC/INFO users from 20 countries gathered in Palm Springs, California for the annual users conference. No growing pains were evident as the Environmental Systems Research Institute (ESRI) skillfully coordinated a week of activities for twice the number of users that attended the 1986 meeting.

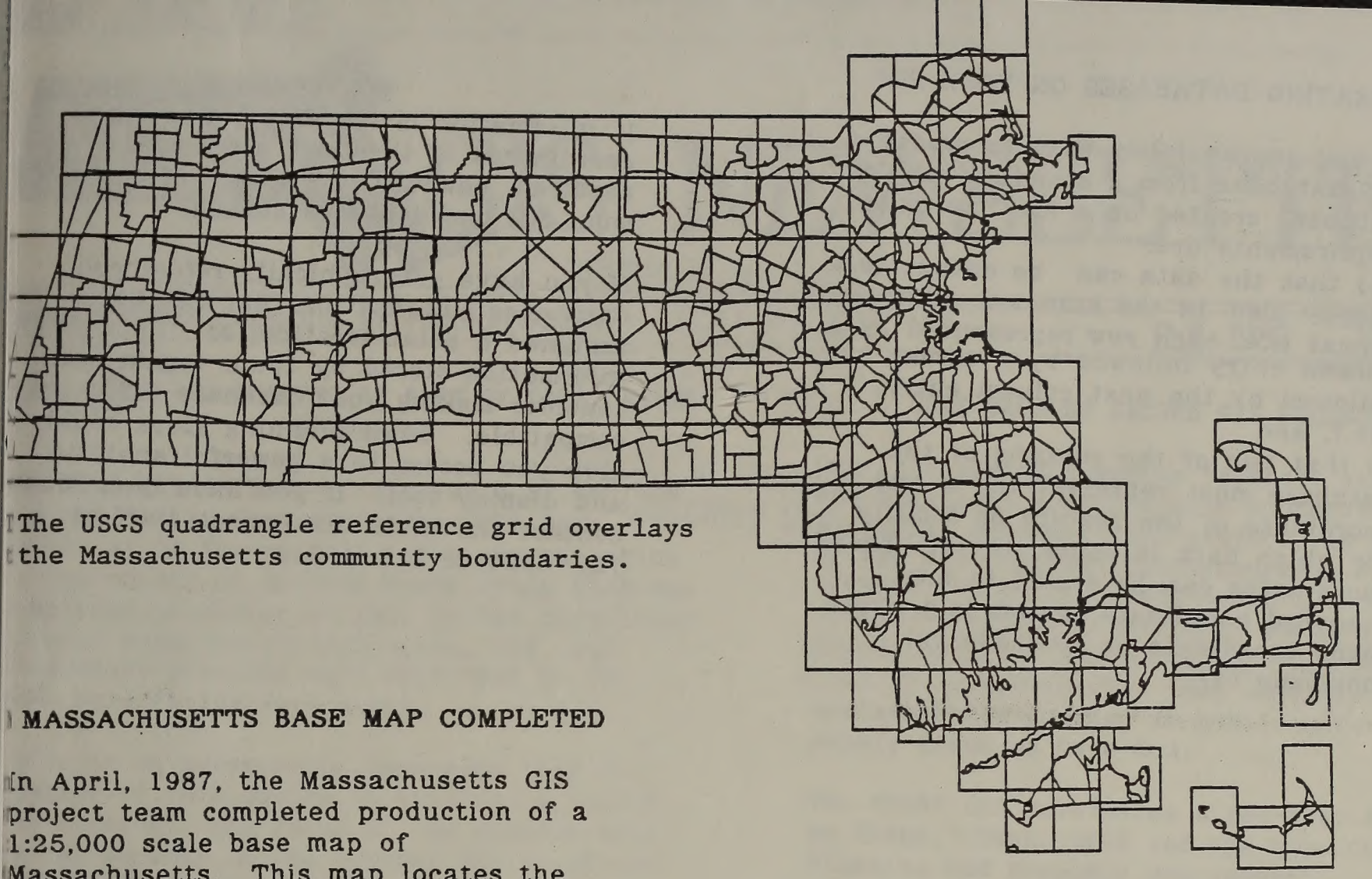
The conference was highlighted by demonstrations of the new version of the ARC software (Version 4.0), which is very close to general release. The development of many new features and timesaving techniques demonstrates ESRI's commitment to improving the functionality and effectiveness of their software.

Another highlight was the introduction of pcARC, designed to run on the IBM PC/AT and compatibles. This software will greatly expand the ARC/INFO user community. It is able to be run either as a stand alone system or in conjunction with mainframe ARC/INFO.

One of the week's most popular activities was viewing the many maps brought by users for the poster competition. The maps displayed a wide range of applications, from pollution monitoring to predicting the location of archeology sites.The graphic quality of many of the maps was extraordinary, showing a full command of modern, high quality plotters.

MASS-GIS Project Wins Prize

"Putting It Together in Massachusetts", a map displaying the various data layers being produced by the MASS-GIS Project won third prize in the Unusual Map category of the poster contest at the recent ARC/INFO Users Conference.



The USGS quadrangle reference grid overlays the Massachusetts community boundaries.

MASSACHUSETTS BASE MAP COMPLETED

In April, 1987, the Massachusetts GIS project team completed production of a 1:25,000 scale base map of Massachusetts. This map locates the boundaries of the 351 communities in Massachusetts. The source maps were 189 stable-based film USGS 7.5'X 7.5' quadrangles borrowed from the Massachusetts Dept. of Public Works..

The 189 sheets were digitized and edgematched to produce a digital map which, if plotted to input scale, is approximately 40 feet by 24 feet. Over 47,000 points were digitized. The staff attempted to maintain National Map Accuracy Standards, which call for 90% of the points to fall within 1/50th of an inch (40 ft @ 1:25,000) of their true location.

It should be noted that the coast line was not digitized along with the political boundaries. The U.S.G.S. National Mapping Division is in the process of producing digital tapes of hydrography and transportation from the 1:25,000 quads. Twenty quads from northeastern Mass. are currently available and have been integrated into the MASS-GIS database. All quads for Massachusetts will be purchased and reformatted as they become available.

A generalized coastline for display purposes has been digitized from the 1:190,000 DPW General Highway Planning map.

NORTHEAST USERS GROUP MAKES WAVES

The Massachusetts GIS Project staff has been actively participating in the Northeast ARC/INFO Users Group since the group's formation in June, 1986. Other members include state and university organizations from Vermont, New Hampshire, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania. The Massachusetts Dept. of Environmental Quality Engineering also participates in the group.

The primary purpose of the users group is to provide a forum for the sharing of ideas, techniques and data. Another goal of the group is to collectively communicate user needs, ideas, and concerns to the Environmental Systems Research Institute (ESRI) the developer of the ARC/INFO software.

The Northeast Users Group was the most organized at the recent ARC/INFO Users Conference in California, and was held up as a model by the company in an attempt to foster similar groups in other regions. The group's consolidated "wish list" was cited numerous times by ESRI officials as an effective way to request software development.

CREATING DATABASES ON YOUR PC?

It has proven fairly easy to create a GIS database from a standard tabular database created on a PC. The only requirements are:

1) that the data can be output to a 'floppy disc' in the standard ASCII format (i.e. each *row* represented by a **column entry** followed by a **comma** followed by the next **column entry**, etc.), and

2) that two of the columns of the database must represent the x and y coordinate of the feature or facility for which data is being stored. These coordinates can be stored in any standard coordinate system [e.g. state plane coordinate or lattitude (y) / longitude (x)].

If information is stored by town, the coordinates of the town are not required, however, the **name** of the town must fill one database column.

If you have geographically referenced databases (information that can be assigned a point location, or information stored by town, region etc.) consider making your database GIS compatible. Small planning steps could give you access to a powerful analytic and display tool. If you have questions contact the MASS GIS Project staff at 727-6930 or 223-4521.

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EOEA GAINS GIS FUNDING AS PART OF DATA CENTER UPGRADE

The EOEA FY1988 budget contains a $2,500,000 capital outlay to upgrade the EOEA Data Center at 20 Somerset St. The appropriation is the result of an EOEA Needs Study that was completed in August of 1987 by the consulting firm of Hayes-Mechling-Kleiman, Inc. and exhaustive planning work performed by the EOEA Data Policy Work Group.

There is an agency-wide consensus that the upgrade of Data Center is critically needed and overdue. The focus of the upgrade will be replacement of the current IBM mainframe with a distributed information network. Included in this network will be a large mini-computer for the Data Center and a moderate mini for DEQE (to be housed at 1 Winter St.)

The new distributed information network will provide a flexible, efficient computer environment for storing large databases and applying advanced software. The network may also host some initial GIS applications although it is not yet certain that the network will be capable of hosting a large state-wide GIS.

Included in the Data Processing Needs Study was a budget for spending the appropriation. GIS applications were noted to be of long-term 'strategic importance' to EOEA and $300,000 was allocated to support their development.

The EOEA GIS Sub-committee has been meeting to plan the expenditure of these funds. Initial plans include reserving some money for GIS software procurement and using other funds as seed money for expanding the GIS database. The sub-committee is working to prioritize new data layer development and insure that all new data will fit current EOEA GIS data standards and be compatible with the developing MassGIS database.

USGS TACKLES SECOND GIS PROJECT

Over the past six months federal, state, and municipal agencies have cooperated on a special demonstration project, as part of the Cape Cod Aquifer Management Project (CCAMP), to build a geographic information system. The GIS is designed to demonstrate the assessment of risk to the quality of groundwater from potential contamination sources at public-water supply sites on Cape Cod.

The CCAMP GIS culminates a two-year effort by MDEQE, USEPA, USGS and the Cape Cod Planning and Economic Development Commission (CCPEDC) to collect hydrologic, geologic and environmental data which pertain to the technical and managerial aspects of groundwater protection.

Ten data layers cover all of Cape Cod and range from major roads a a scale of 1:190,000 to landfills at a scale of 1:25,000. Twenty additional data layers focus on the case study towns of Barnstable and Eastham and include Barnstable's parcel-based land-use at 1:7,200 and Eastham's wetlands at 1:5,000.

GIS technology gives CCAMP the capability to compile these diverse data sets from widely varying scales and sources into a coherent database. The GIS aids analysis by making it possible to overlay several data layers at once and to evaluate potential contamination sources, such as underground storage tanks, based on their characteristics and on their proximity to public-water supply sites.

The CCAMP GIS has demonstrated several scenarios to assess risk from ground water contamination and has begun the important process of familiarizing agencies with the potential of GIS technology. The data developed for this project could well form the core of a comprehensive Cape-wide GIS that could serve many planning purposes in the future.

Cooperative project of the Massachusetts Hazardous Waste Facility Site Safety Council and the U.S. Geological Survey, Water Resources Division.

LAND-USE MAPPING IN PROGRESS

Land-use data is fundamental for a wide variety of planning, and regulatory activities. Surprisingly, the most recent, Massachusetts-wide coverage was done in 1974 at the general scale of 1:250,000.

An ongoing project involving several agencies and Mass-GIS will produce new, digital, land use data at 1:25,000 for almost half of the communities in Massachusetts. The EOEA GIS Sub-committee is in the process of developing strategies to encourage completion of this work for the rest of the state.

Ongoing Project

The history of the ongoing project illustrates how other digital data layers can be produced by sharing resources and results.

The Mass Department of Public Works (MDPW) and the Metropolitan Area Planning Council (MAPC) need statistics on land use, and land-use change in 164 eastern Massachusetts communities for use with a growth prediction model. They originally planned to have the land-use mapping group at University of Massachusetts, Amherst photo-interpret the region and measure acreages of land uses in transportation zones through manual techniques.

Mass-GIS staff saw the photo-interpretation work as an opportunity to produce digital land-use data of potential use to a wide variety of projects beyond MDPW/MAPC. If digital data were available, GIS software could easily generate the land-use statistics MDPW/MAPC required for their model.

After several meetings and a demonstration MDPW, MAPC and the staff of Mass-GIS agreed to a benchmark test involving one community. The test was successful. MDPW, in the process of planning for a digital mapping system of their own, saw that future uses for the digital data clearly justified the additional 15% cost.

MDPW/MAPC have contracted with UMASS and currently production is underway for the digitization of land-use in 164 communities in eastern Massachusetts.

Procedure

The land-use mapping group at the Department of Forestry & Wildlife Management (DFWM) has been making land-us maps of Massachusetts since 1951. Their last statewide mapping was done in 1971. The land-use mapping group procured PC-ARC/INFO this year and is taking full advantage of GIS technology as they proceed with the 1985 land-use map.

The new 1985 map will be made by compositing two separate maps. First, a mylar, 1971 land-use map showing 21 land-use classes is compared to a 1985 color-infrared photograph by a photo-interpreter. A new 'land-use change map' is created from this comparison that sho only areas that have changed since 1971 and their new land-use class. Then, the change map and the 1971 land-use map are digitized by DFWM staff.

The two digitized maps are delivered to Mass-GIS on floppy disc. Mass-GIS uses the main-frame version of ARC/INFO to intersect the two maps into a composite. A program is then run which performs several operations on the data to conver square feet to acres and produce tabular reports for MDPW/MAPC showing acreages i each of the 21 land-uses for each transportation zone for both 1971 and 1985.

In return, Mass-GIS retains a copy of bo the 1971 and 1985 land-use data for futu USGS and EOEA applications.

EPA REGION I ENTERS THE GIS WORLD

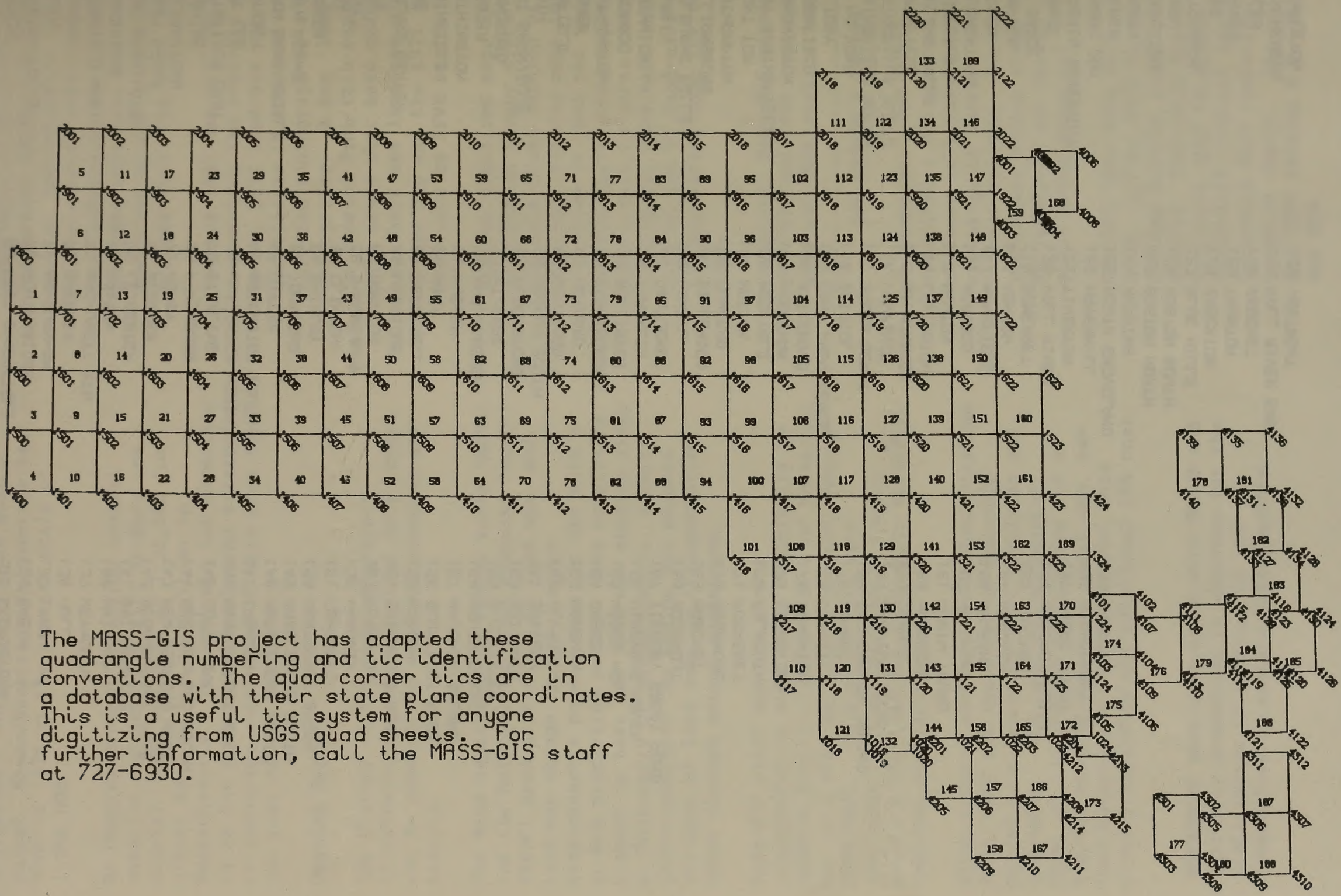
In November, 1987 USEPA, Region I will establish a GIS program through the purchase of hardware, software and the expansion of current facilities at the J Federal Building, Boston. The New Engla region was chosen along with the Philadelphia and Kansas City offices to pilot study areas for GIS projects.

The GIS work area will include a PRIME 2755, CalComp 5835 Electrostatic Plotter CalComp backlit digitizing pad, 4-pen ZE plotter, Tektronix digitizing table, thr Tektronix 4107 terminals, ten PC's runni TGRAF-4107 terminal emulation software, Tektronix 4510 rasterizer, and a color graphics copier. The software includes ARC/INFO version 4.0, GRID/TOPO, Network, and TIN.

Massachusetts Quad Numbers and Corresponding Names

1 CANAAN
2 STATE LINE
3 EGREMONT
4 BASHBISH FALLS
5 BERLIN
6 HANCOCK
7 PITTSFIELD WEST
8 STOCKBRIDGE
9 GREAT BARRINGTON
10 ASHLEY FALLS
11 WILLIAMSTOWN
12 CHESHIRE
13 PITTSFIELD EAST
14 EAST LEE
15 MONTEREY
16 SOUTH SANDISFIELD
17 NORTH ADAMS
18 WINDSOR
19 PERU
20 BECKET
21 OTIS
22 TOLLAND CENTER
23 ROWE
24 PLAINFIELD
25 WORTHINGTON
26 CHESTER
27 BLANDFORD
28 WEST GRANVILLE
29 HEATH
30 ASHFIELD
31 GOSHEN
32 WESTHAMPTON
33 WORONOCO
34 SOUTHWICK
35 COLRAIN
36 SHELBURNE FALLS
37 WILLIAMSBURG
38 EASTHAMPTON
39 MOUNT TOM
40 WEST SPRINGFIELD
41 BERNARDSTON
42 GREENFIELD
43 MT TOBY
44 MT HOLYOKE
45 SPRINGFIELD NORTH
46 SPRINGFIELD SOUTH
47 NORTHFIELD
48 MILLERS FALLS
49 SHUTESBURY
50 BELCHERTOWN
51 LUDLOW
52 HAMPDEN
53 MT GRACE
54 ORANGE
55 QUABBIN RESERVOIR
56 WINSOR DAM
57 PALMER
58 MONSON
59 ROYALSTON
60 ATHOL
61 PETERSHAM
62 WARE
63 WARREN
64 WALES
65 WINCHENDON
66 TEMPLETON
67 BARRE
68 NORTH BROOKFIELD
69 EAST BROOKFIELD
70 SOUTHBRIDGE
71 ASHBURNHAM
72 GARDNER
73 WACHUSETT MTN
74 PAXTON
75 LEICESTER
76 WEBSTER
77 ASHBY
78 FITCHBURG
79 STERLING
80 WORCESTER NORTH
81 WORCESTER SOUTH
82 OXFORD
83 TOWNSEND
84 SHIRLEY
85 CLINTON
86 SHREWSBURY
87 GRAFTON
88 UXBRIDGE
89 PEPPERELL
90 AYER
91 HUDSON
92 MARLBOROUGH
93 MILFORD
94 BLACKSTONE
95 NASHUA SOUTH
96 WESTFORD
97 MAYNARD
98 FRAMINGHAM
99 HOLLISTON
100 FRANKLIN
101 PAWTUCKET
102 LOWELL
103 BILLERICA
104 CONCORD
105 NATICK
106 MEDFIELD
107 WRENTHAM
108 ATTLEBORO
109 EAST PROVIDENCE
110 BRISTOL
111 SALEM DEPOT
112 LAWRENCE
113 WILMINGTON
114 LEXINGTON
115 NEWTON
116 NORWOOD
117 MANSFIELD
118 NORTON
119 SOMERSET
120 FALL RIVER
121 TIVERTON
122 HAVERHILL
123 SOUTH GROVELAND
124 READING
125 BOSTON NORTH
126 BOSTON SOUTH
127 BLUE HILLS
128 BROCKTON
129 TAUNTON
130 ASSONET
131 FALL RIVER EAST
132 WESTPORT
133 EXETER
134 NEWBURYPORT WEST
135 GEORGETOWN
136 SALEM
137 LYNN
138 HULL
139 WEYMOUTH
140 WHITMAN
141 BRIDGEWATER
142 ASSAWOMPSET POND
143 NEW BEDFORD NORTH
144 NEW BEDFORD SOUTH
145 CUTTYHUNK
146 NEWBURYPORT EAST
147 IPSWICH
148 MARBLEHEAD NORTH
149 MARBLEHEAD SOUTH
150 NANTASKET BEACH
151 COHASSET
152 HANOVER
153 PLYMPTON
154 SNIPATUIT POND
155 MARION
156 SCONTICUT NECK
157 NAUSHON ISLAND
158 SQUIBNOCKET
159 GLOUCESTER
160 SCITUATE
161 DUXBURY
162 PLYMOUTH
163 WAREHAM
164 ONSET
165 WOODS HOLE
166 VINEYARD HAVEN
167 TISBURY GREAT POND
168 ROCKPORT
169 MANOMET
170 SAGAMORE
171 POCASSET
172 FALMOUTH
173 EDGARTOWN
174 SANDWICH
175 COTUIT
176 HYANNIS
177 TUCKERNUCK ISLAND
178 PROVINCETOWN
179 DENNIS
180 NANTUCKET
181 NORTH TRURO
182 WELLFLEET
183 ORLEANS
184 HARWICH
185 CHATHAM
186 MONOMOY POINT
187 GREAT POINT
188 SIASCONSET
189 HAMPTON

STANDARDIZED USGS QUADRANGLE NUMBERS AND TIC-ID'S



The MASS-GIS project has adapted these quadrangle numbering and tic identification conventions. The quad corner tics are in a database with their state plane coordinates. This is a useful tic system for anyone digitizing from USGS quad sheets. For further information, call the MASS-GIS staff at 727-6930.

DATA UPDATE:
MASS-GIS DATA LAYERS STATUS

Political Boundaries: Both a detailed 1:25,000 scale layer and a generalized 1:190,000 layer of all communities are 100% complete.

Drainage Basins: Over 1700 sub-basins are being digitized from the USGS-WRD 1:24,000 manuscripts. This layer is 90% complete.

Surficial Geology: Sand and gravel deposits are being digitized from USGS-NMD 1:125,000 manuscripts. This layer is 35% complete.

Public Water Supplies, Waste Sources & EPA Facilities: These data layers are installed on the Mass-GIS system. Updates to the database are ongoing.

Transportation & Hydrography:
The linework for this crucial basemap data is produced by USGS-NMD at 1:100,000. The linework closely matches 1:25,000 quads. Editing is needed to edgematch and add attributes.
100% of the state has been acquired, 10% has been integrated into the GIS.

Elevation Data: Ten quadrangles of Digital Elevation Models (DEM's) have been procured showing elevations at 30 meter grid intervals.

Other Statewide Data in the Database

- The 1:250,000 1974 GIRAS land-use data: from the USGS National Mapping Division.

- The GEONAMES database containing over 10,000 geographic place names located on topographic quads: from USGS-NMD.

- The 1:250,000 Digital Terrain Models from the Defense Mapping Agency showing small-scale hypsography have been procured, although they are not currently integrated into the GIS.

Building on the foundation established through a joint USEPA/USGS/DEQE/CCPEDC project to explore GIS uses for the Cape Cod Aquifer Management Project (CCAMP), EPA will provide support for environmental projects throughout New England. Primary areas of interest for GIS applications are support for the Quincy Bay, Boston Harbor, and Massachusetts Bay projects.

STATE PLANE COORDINATES VS LATITUDE/LONGITUDE COORDINATES

All data layers in a GIS database should be stored in a common coordinate system to facilitate data registration (the ability of data to be easily overlayed with other data).

The MassGIS database is constructed in the Massachusetts State Plane Coordinate System (SPC). All points and lines from the various data layers have **x** and **y** coordinates which are stored as state plane feet.
The Massachusetts SPC system was selected over the more familiar latitude/longitude system for four reasons:

1) SPC are easily stored as decimal numbers while lat/long are generally stored as degrees, minutes, and seconds.

2) Degrees are a *relative* unit of measurement. One degree of longitude has a different length at every different latitude. This fact proves difficult for the GIS to handle.

3) With SPC coordinates the GIS returns foot or square foot values from distance or area calculations. These units can easily be converted by the GIS to useful measurements such as, miles, kilometers, acres or hectares. If degrees **were** the coordinate unit then GIS distance or area calculations would be returned as degrees or square degrees. This is undesirable because of the relative nature of the degree.

4) It is extremely easy to convert lat/long values into SPC values using the GIS. Consequently, any data sets that currently use lat/long as coordinate reference may be incorporated into the GIS without difficulty. (It is understood that it is much easier, in most cases, to read lat/long values off of a quad than SPC. Database developers should not be discouraged from using lat/long or other standard coordinate systems (e.g. UTM) for their interpolation of point locations.)

SPC Quiz:

1) The Massachusetts SPC grid origin is in which state?

2) The SPC "X Max" value of appx. 1,029,000 ft. is located in which community?

3) The SPC "Y Max" value of appx. 755,000 ft. is located in which community?

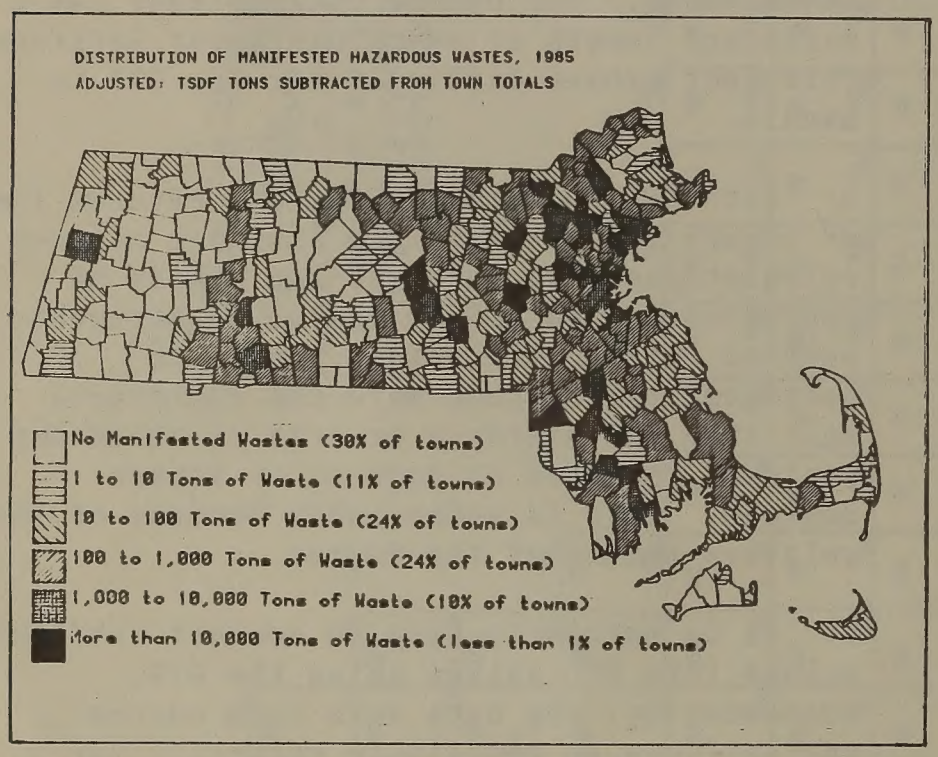
Answers: 1) New York 2) Chatham 3) Salisbury

KEEP THOSE FLOPPY DISCS COMING

Since the last newsletter the MassGIS Project has cooperated with several other state agencies to conduct small scale tests that involve bringing their data into the evolving GIS Database.

Department of Environmental Management: DEM Office of Safe Waste Management added three columns of 1985 data; tons of hazardous waste, number of hazardous waste generators and tons per generator; aggregated by community into the town database.

Department of Public Health: The Health Statistic Unit of the Cancer Registry added several columns of data regarding 'standard incidence ratios' of cancers to the town database.


DISTRIBUTION OF MANIFESTED HAZARDOUS WASTES, 1985
ADJUSTED: TSDF TONS SUBTRACTED FROM TOWN TOTALS
No Manifested Wastes (30% of towns)
1 to 10 Tons of Waste (11% of towns)
10 to 100 Tons of Waste (24% of towns)
100 to 1,000 Tons of Waste (24% of towns)
1,000 to 10,000 Tons of Waste (10% of towns)
More than 10,000 Tons of Waste (less than 1% of towns)

Department of Food and Agriculture: Th Agricultural Preservation Restriction (APR) program added number of acres of land in APR as well as number of APR's town to the town database.

UMass Water Resources Research Center: This group made available the extensive Ponds and Lakes and Streams and Rivers Information Systems (PALIS and SARIS) t the GIS. These databases provide excellent water chemistry attributes to the hydrography data layer.

UMass Department of Landscape Architect and Regional Planning (LARP): This gro has worked on a GIS that was developed house for several years. The 'MAPLES' system has been used to conduct a study the Connecticut River Greenway for DEM. Political boundary and land-use data fr that study was successfully delivered t Mass-GIS and imaged on the ARC/INFO system. The complete database is forthcoming.

These exchanges were informal agreement whereby the data was delivered to the MassGIS project on a floppy disc and a derivative product, generally a shaded choroplethic map, was returned to the agency supplying the data.

If you have town based information or databases which contain coordinate reference (lat/long fields) and are interested in seeing your data imaged, call the MassGIS project at 727-6930.

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